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AUTHOR Atkins, Richard; And Others

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ABSTRACT

To investigate the feasibility of developing hands-on instruments to aid classroom teachers in assessing both entering and exiting skills of the special needs students in vocational education, a continuing project at the University of Pittsburgh was conducted to meet two major objectives: develop a definitive rationale for the design of a hands-on instrument by which the vocational classroom teacher could diagnose entry skills and measure exit skills of special education students and design a hands-on instrument based on the above rationale for several occupational areas. The project resulted in the following outcomes: the development of a rationale and procedures for the design of the instruments, an entering instrument to diagnose auto mechanics skills, and an exiting instrument to assess competence in food services skills. A large appendix accompanies this final report and includes the following materials: an example of synthesis procedures (auto mechanics); the auto mechanics synthesis; the food services synthesis; the auto mechanics entering skills instrument; the food services exiting skills instrument; and the rationale paper supporting the hands-on instrument project. (Author/BM)

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FINAL REPORT

CONTINUATION OF A PROJECT TO DEVELOP A VOCATIONAL CLASSROOM TEACHER'S "HANDS-ON" INSTRUMENT TO MEASURE ENTRY AND EXIT SKILLS OF THE SPECIAL EDUCATION STUDENT FOR SPECIFIC OCCUPATIONS

(Project No. 19-6818)

Sheila H. Feichtner, Project Director
Thomas V. O'Brien, Project Director
Richard Atkins, Principal Investigator

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PREFACE

Critical to the development of any vocational program designed tc mainstream the special education student is the identification of the entrance skills necessary for success in the classroom and the exit skills necessary for succesr on the job. The entry and exit skills essential for occupational competence consist of (social attributes). This proposal was concerned primarily with the identification of employment skills idiosyncratic to specific occupations and the development of "hands-on" diagnostic tests which could be administered by the classroom teacher. The combination of a diagnostic instrument and an individualized curriculum package building from the simple to the complex will enable the vocational classroom teacher to identify the appropriate entry point for each student into the curriculum and an appropriate exit point on the occupational career ladder.

ABSTRACT

Project Number 19-6818: Continuation of a Project to develop a Vocational Classroom Teacher's "Hand-On" Instrument to Measure Entry and Exit Skills of the Special Education Student for Specific Occupations

Sheila H. Feichtner, Project Director
Thomas W. O'Brien, Project Director
Richard Atkins, Principal Investigator

The purpose of the project was to investigate the feasability of developing "hands-on" instruments to aid classroom teachers in assessing both entering and exiting skills of the special needs student. Using materials idiosyncratic to a given occupational area, a classroom teacher could use these instruments to aid in either diagnosis of entry level behaviors or summative evaluation of exit-level behaviors.

Objectives

1. Develop a definitive rationale for the design of a "hands-on" instrument by which the vocational classroom teacher could diagnose entry skills and measure exit skills of special education students.
2. Design a "hands-on" instrument based on the above rationale for several occupation areas.

Outcomes

1. A rationale was developed and procedures were established resulting in the design of "hands-on" instruments for measuring entry and exit-level skills for any given occupational area.
2. An entering instrument was developed to diagnose Auto Mechanics skills.
3. An exiting instrument was developed to assess competence in Food Services skills.

4. The conception of the entering instruments was found to be of practical utility as a diagnostic tool.

5. The conception of the exiting instruments was found to be repetitive of existing assessment devices and/or procedures.

Audience

The resulting reports, describing the design procedures, and the instruments developed, are useful to vocational administrators and teachers.

Publications and Available Materials

- Final Report
- Auto Mechanics: Entering Instrument

Methods

As mentioned earlier, there were two major tasks for this project: (a) the development of the synthesis of job descriptions for each vocational area and (b) the design of the "hands-on" diagnostic instruments. Different procedures were followed to meet each major task. These procedures will be described below.

Synthesis Procedures

The objective of this task was to investigate various procedures which could be followed to group all available listings of individual job descriptions according to shared attributes such as "small motor dexterity," "physical coordination," "measurement skills," etc. There were six steps involved in this procedure.[1]

[1] A short example of this six-step synthesis procedure can be found in Appendix A. For optimal understanding, the reader is advised to read the description of the six steps, then refer to the example provided.

Step 1. The first task was to compile all listings of individual job descriptions and the specific skills and/or abilities involved in each. The source found most helpful was the Dictionary of Occupational Titles (DOT). Other similar listings, such as curriculum guides from school districts and the materials from the Instructional Objectives Exchange (IOX) were incorporated. While an exhaustive listing of every skill and/or ability is not included, a list of the various job titles for the occupational area of Auto Mechanics used in this study can be found in Table 1.

TABLE 1

Specific Job Titles Used to Develop Auto Mechanics Synthesis

1. Air conditioning mechanic - Automobile refrigeration
2. Automobile brakeman
3. Automobile mechanic
4. Automobile mechanic, helper
5. Automobile radiator man
6. Automobile service mechanic
7. Automobile service station attendant
8. Automobile tester
9. Automotive electrician
10. Automotive electrician, helper
11. Automotive maintenance and Equipment serviceman
12. Automotive parts man
13. Brake adjustor
14. Brake, drum and lathe operator
15. Carburetor man
16. Front-end man
17. Fuel injection serviceman
18. Lubrication man
19. Motor vehicle inspector
20. Service manager
21. Spring repairman helper, hand
22. Steam cleaner
23. Fire repairman
24. Transmission mechanic
25. Tune-up man

From each of the 25 job titles from Table 1 there were 179 separate skills and/or abilities which comprised the data for this step in the synthesis.

Step 2. These complete lists are then grouped according to shared "commonalities" between, rather than within, the listings for each job title. At this point in the process, "commonalities" refers to any factor(s) that the various skill(s) may share with any other(s). There must be a relatively high degree of flexibility at this time; frequently, a given skill can be placed in more than one general grouping.

Step 3. These clusters of "similar" skills are then re-grouped to form listings that, while not yet mutually exclusive, begin to lend themselves to transformations (ie, additions/deletions) without loosing the general group identity. Basically, this process is directed at narrowing the "commonalities" of various groups to form more distinctly different groupings. The major guidelines for deciding what makes one group differ from the next come from a knowledge of the content area, specifically how each skill is to be employed within that specific frame of reference.

Step 4. Each cluster is now analyzed in terms of (a) what general factor is common to all skills in the cluster and (b) how many of the individual skills can be analyzed into a "lowest common denominators." Specifically what is involved here is the initial labeling of each cluster in terms of general skills (eg, "large motor dexterity").

In order to maintain some degree of continuity across the various synthesis, the labels given to each cluster were based on the organization found in Table 2. Not every item in Table 2 will be appropriate for every specific synthesis one may desire to develop; the intension is to provide a general guideline for the grouping and/or labeling of individual skills.

TABLE 2

Guidelines for the Organization of Specific Skills into Larger Units

PSYCHOMOTOR	PSYCHOLOGICAL	COGNITIVE	SENSORY
CO-ORDINATION	TOLERANCE TO ERROR	NUMEROSITY	VISION
Stimultaneous Movement	Frustration	Counting	Acuity
eye/hand	Persistance	Addition	Attention
eye/foot	PLANNING ABILITY	Subtraction	Depth Visualization
eye/hand/foot	ORGANIZATIONAL ABILITY	Multiplication	COLOR
Precise Speed Movement		Division	Perception
eye/hand		Fractions	Discrimination
eye/finger		Decimals	TACTILE
VISUAL TRACKING		Ratio and Proportion	TIME PERSPECTIVE
Dexterity		MEASUREMENT	
Gross Motor Control		Volumetric	
Fine Motor Control		Linear	
GRASP		Metric	
STEADINESS		COMMUNICATIONS	
ENDURANCE		Following Diagramatics	
STRENGTH		Following Models	
RANGE OF MOTION		Simple Detail	
		Complex Detail	
		Rotation	
		Directionality	
		Following Verbal Instruction	
		Following Written Instruction	
		PERCEPTION AND DISCRIMINATION	
		Form Perception	
		Spatial Discrimination	
		Size Discrimination	
		CLERICAL ABILITY	

An integral part of this process is further analysis of the individual skills by asking the question: "Can several individual skills be grouped within the cluster or must each stand alone?" Thus far, it has occurred that many individual skills can be grouped in such a manner, thereby reducing the total number of skills under each cluster while maintaining the overall cluster identity. In spite of initial labeling of clusters, it can still be possible at this time to have two or more clusters contain the same specific skill.

Step 5. Final labeling can now occur for each cluster of skills. In cases where a given skill had been initially placed under two or more clusters, decisions were made resulting in a "most appropriate" placement for each specific skill. Again, these decisions were made in reference to the function of the particular skill within the occupational area under consideration and followed the guidelines found in Table 2.

Step 6. This final step in the synthesizing procedure involves a summative evaluation by content specialists in terms of content validity of the clusters. While similar formative feedback was found to be extremely beneficial during all the steps in this process, it is manditory for the summative evaluation to occur. This result of this evaluation was a classification of all skills under a given occupational area into clusters of easily-identifiable, mutually exclusive groupings of shared characteristics.

As another example of this process, Appendix B contains the final synthesis of the 179 individual skills initially found for the

25 job titles for Auto Mechanics found in Table 1. The results of the synthesis for Food Services can be found in Appendix C.

Instrument Design

The objective of this task was to design the actual "hands-on" instruments for both Auto Mechanics and Food Services. Copies of these instruments can be found in Appendices D and E. There were three steps involved in this procedure.

Step 1. The core of the test item development was the synthesis resulting from the previously described procedures. Every task, item, material, etc. must have directly reflected the corresponding section of the core analysis, or synthesis.

Step 2. In order to simplify the instrument itself, the following question was examined. "Were there any skills, although distinct in their own right, which are so similar as to give rise to one item of measurement?" Whenever possible, one large task was designed that could be scored such that all individual skills were assessed. An example of the outcome of this procedure can be seen in the Auto Mechanics - Entering Skills, item 1: Removing and Replacing Tire (See Appendix D).

Step 3. For each item, one task was designed to assess performance of each skill and/or ability. A critical requirement for each item was the use of materials commonly found within the occupational area. This allowed for greater probability of the materials being readily available (and the corresponding decreased need of purchasing additional materials) as well as the assessment of student performance with materials to be used throughout the course, thereby adding to the content validity of the instruments.

Findings and Analysis

There were several important findings of this project, relative to the two main tasks discussed earlier. Results will be reported in terms of (a) the synthesis procedures and (b) the actual instrument construction. Modifications of procedures and products were deemed necessary based upon the frequent formative and summative feedback from content specialists in both Auto Mechanics and Food Services.

The most significant finding concerned the procedures developed to synthesize all available job descriptions for each vocational area. It was found that the procedures were valid, logical and easily generalized to include any vocational area. The most useful part of this procedure was felt to be the feedback from the content specialists as a continual process.

In terms of the actual "hands-on" instruments themselves, it was orginally intended to design one instrument that could serve to measure both entry and exit-level skills. Feedback indicated, however, that this goal could not be met. The purpose of the entry-level instrument was basically diagnostic[2]; the exit-level instrument was achievement oriented. These two purposes ruled out the possibility of using one form to meet both needs. Therefore it was decided to design separate instruments for entry and exit level skills. The important factor each

[1]See Appendices D and E for examples of instruments developed for Auto Mechanics and Food Services.

[2]It should be noted that the entering instrument is intended to be used as a diagnostic device (ie, indicating strengths and limitations) rather than a screening device (ie, indicating who should or should not enter the particular course of study).

would have in common was that they were based upon the synthesis developed for the particular vocational area in question.

Because two forms were needed for each vocational area, different scoring procedures were necessary. To meet the diagnostic needs of the entry-level instruments, a general scoring criteria was developed.

1. Cannot perform correctly
2. Performs correctly, but with great difficulty
3. Performs correctly, but with some difficulty
4. Performs correctly with no difficulty

This scoring system, as one means of identifying student characteristics at a beginning level, could allow for relatively quick diagnosis in terms of at least (a) the teacher's plans for course activities; (b) special needs of individual students, including possible referrals to other professionals such as reading specialists; and (c) special alterations in instructional strategies that could increase an individual student's chances of success in mastering the course content.

The exiting instruments were more detailed in terms of tasks and scoring criteria. In comparison to the entering instruments, these items generally required student performance on more complex tasks; the scoring criteria focused on the quality of performance. While the items were based upon the same skills and/or abilities as the entering instruments, (ie, the synthesis), this instrument served a different purpose. Basically the exiting instruments were achievement tests reflecting how well the students could perform tasks forming the core experiences of a given vocational area. Based upon the format of this instrument, it was felt the results could yeild information supplemental to a "pass-fail" decision: The results could form the basis for developing competency lists for each student, describing both strengths and limitations in the given field. It was

felt this could be a positive step in locating a "most appropriate" work situation for each student, thereby increasing the likelihood of job success.

While the entering instruments were felt to possess promise as easily administered, valid (at this time only in terms of content) diagnostic tools, the exiting instruments were considered duplications of existing evaluation devices, and would serve to complicate, rather than to simplify, the final evaluation process. Therefore, a decision was made to direct future efforts in this endeavor only toward development and refinement of the entering instruments and evaluations of their reliability and validity as diagnostic assessments.

CONCLUSIONS AND RECOMMENDATION

For a second year in a row this project did not meet its objectives because of personnel problems and late funding. The principal investigator (T. Gemmel) into the project in September 1976 underwent open-heart surgery in January 1977 and was replaced by R. Atkins in May 1977. The original time-line and its revisions are shown below.

Original time-line	7/1/76	9/1/76	1/1/77	3/1/77	5/1/77	8/1/77
T. Gemmel hired	10/1/76	12/1/76	3/1/77	5/1/77	7/1/77	10/1/77
R. Atkins hired	6/1/77	8/1/77	12/1/77	2/1/78	4/1/78	7/1/78

Complete design of food service and auto mechanics instrument

Begin face validity evaluation

Begin design of additional instrument

Begin face validity of additional instrument

This project resulted in the development of procedures which (a) synthesize individual job descriptions under general vocational areas into a core set of basic skills and/or abilities; and, based upon these syntheses, (b) produce measurement devices utilizing materials idiosyncratic to the vocational area that can aid a classroom teacher in diagnosing entering behavior of students. The addition of V-TECS catalogues of performance objectives and criterion-referenced measures to the literature in the field of task analysis will enable us to skip at least steps 1 through 4 in the synthesis procedures for future instrument design in trade areas where the V-TECS material is available.

Based upon these conclusions, the following are some recommendations for future investigation:

1. The scope of the synthesis should be expanded to include as many vocational areas as possible.

2. Entering diagnostic instruments should be developed for each of these additional vocational areas.

3. Procedures should be designed and implemented to assess both the reliability (test-retest and inter-scorer) and the validity (concurrent and predictive) of each diagnostic instrument to be developed.

4. Procedures should be developed tc aid classroom teacher in the use of these instruments, from administration through interpretation. These could range from preparation of detailed manuals to a series of workshops.

APPENDIX A

Example of Synthesis Procedures - Auto Mechanics

APPENDIX A

Example of Synthesis Procedures - Auto Mechanics

Step 1 (list all skills)

collect payment in cash
use thickness gauge
use calipers
complete credit card form
take inventories
read gas pump for quantity and price
use tachometer
check tread depth with tread gauge
provide correct change for cash payments

Step 2 (group according to commonalities)

Cluster 1: collect payment in cash
read gas pump for quantity and price
provide correct change for cash payments

Cluster 2: use thickness gauge
use calipers
use tachometer
check tread depth with tread gauge

Cluster 3: read gas pump for quantity and price
take inventories
complete credit card form
provide correct change for cash payments

Step 3 (Regrouping)

Cluster 1: collect payment in cash
read gas pump for quantity and price
provide correct change for cash payments
complete credit card form

Cluster 2: use thickness gauge
use calipers
use tachometer
check tread depth with tread gauge

Cluster 3: read gas pump for quantity and price
take inventories
complete credit card form
provide correct change for cash
collect payment in cash

Step 4 (Initial Labeling of Step 3)

Cluster 1: Computational Skills
Cluster 2: Measurement
Cluster 3: Language Communication Skills

Step 5 (Final, Mutually - exclusive grouping)

Computational Skills: collecting payment in cash
: providing correct change

Measurement: use thickness gauge
use calipers
use tachometer
check trend depth with tread gauge

Language Communication Skills
- reading gas pump for quantity and price
- completing credit card form
- taking inventories
- collecting payment in cash

Step 6 (Analysis by Content Specialists)

APPENDIX B

Auto Mechanics: Synthesis

Auto Mechanics: Synthesis

I. Small Motor
   A. Wrist turn
   B. Finger grasp (manipulation/control)
   C. Two-hand coordination

II. Large Motor
   A. Pouring liquids through small openings
   B. Two-hand coordination

III. Measurement
   A. Reading 6" steel rule
   B. Reading gauges
   C. Recognition of abbreviations
      1. Linear
      2. Volume
   D. Computational Skills
      1. Providing correct change
      2. Totaling cable resistance

IV. Language Communication Skills
   A. Reading
      1. Basic text material
      2. Simple forms
   B. Writing
      1. Legibility

V. Physical Strength/Coordination
   A. Lifting tire/small units
   B. Rolling tire

VI. Tool Identification

APPENDIX C

Food Services: Synthesis

Food Service: Synthesis

A. Measurement
   1. Graduated containers
      a. dry ingredients
      b. liquid ingredients
   2. Scales (for weight)
   3. Setting thermostats/oven controls
   4. Uniform portioning
      a. cutting (e.g., dough, meat)
      b. scouping (e.g., ice cream, salads)

B. Small motor dexterity
   1. Peeling fruits, vegetables, etc.
   2. Cutting fruits, vegetables, etc.
   3. Dicing fruits, vegetables, etc.
   4. Using spatula to flip (e.g., on grill)
   5. Applying icings, glazings, toppings

C. Large Motor dexterity
   1. Rolling dough
   2. Forming pastries (e.g., tarts, cookies)
   3. Cutting foods (e.g., meats)
      a. manually
      b. machine

D. Spatial Organization
   1. Placing dough (e.g., cookies) on sheet

E. Color perception/knowledge
   1. Visual discrimination
      a. shades of brown (to adjust oven temperatures)
   2. Blending colors (to prepare icings)
      a. knowledge of primary and secondary colors

F. Language Communication Skills
   1. Reading
      a. labels, for
         1. proper storage
         2. amount/weight of contents
         3. contents

b. menus
c. forms (e.g., to maintain records, time cards)
d. abbreviations
1. amount
2. volume
3. weight
e. tax tables

2. Writing
a. legibility (in terms of relating orders to cooks)
3. Following verbal/written directions
a. in food preparations, recipes

G. Computational Skills
1. Adding checks
2. Figuring tax
3. Counting change

H. Physical strength
1. Lifting heavy, portable equipment
2. Distributing baking supplies
3. Carrying/balancing trays of food

APPENDIX D

Auto Mechanics Instrument: Entering Skills

Auto Mechanics Instrument - Entering Skills

With the exception of "Right-wrong" tasks (specifically "Providing correct change," "Totaling cable resistance," "Reading 6" steel rule," "Reading gauges," and "Tool identification") all tasks for entering skills are rated on the following diagnostic scale:

1. Cannot perform correctly
2. Correctly performs with great difficulty
3. "Performs with some difficulty"
4. "Performs with no difficulty"

The following are descriptions of the tasks for "Auto Mechanics Instrument - Entering Skills":

1. Removing and Replacing Tire. This task focuses on the following skills from the core analysis: reading gauges (i.e., air pressure in tire); entire Physical Strength/Coordination skills.
2. Nut and Bolt. This task, requires the student to tighten and then loosen a nut on a 6" bolt, will add additional assessment of the Small Motor skills.
3. Pouring Liquids. This task, requires the student to pour liquids from a large container, through a funnel, into smaller containers, focuses on Large Motor: Pouring liquids; and Measurement; recognition of common size containers and recognition of abbreviations of volume.
4. Linear Measurement. This task requires the student to use a 6" steel rule to measure four standard lines. The measurement requires the ability to read the rule to 1/16".
5. Measurement - Abbreviations. This task requires recognition describe the task of common abbreviations for both linear and volume measurement.

Auto Mechanics Instrument - Entering Skills cont'd.

6. Reading - Basic Text. This task involves the student's reading a page from a basic auto mechanics text book for comprehension of both content and technical language.
7. Reading - Forms. This task requires student to read simple forms such as time cards and work-order forms and recognize what data is called for for correct completion of form.
8. Writing - Legibility. This task requires the student to write given information on a work-order form. The focus is on legibility of communicated information.
9. Providing Correct Change. This task requires the student to correctly provide change in each of four items.
10. Totaling Cable Resistance. This task requires the student to correctly total a given set of individual cable resistances.
11. Tool Identification. This task requires the student to correctly identify 20 tools common to auto mechanics, which are beneficial for a beginning student to know.

APPENDIX E

Food Services Instrument: Exiting Skills

Food Service - Exiting Skills

Task 1

Materials: series of graduated measuring cups, flour

Procedures: student must fill cups to following levels:

a. ½ cup

b. 1 cup

c. 1¼ cup

d. 3/4 cup

Scoring: 1 point each correct response

Task 2

Materials 2 cup measuring cup; supply of water

Procedures: student must fill cup to following levels:

a. 2 cups

b. ¼ cup

c. 1 3/4 cup

d. ½ cup

Scoring: 1 point each correct response

Task 3

Materials: scale calibrated in pounds and ounces; 2 lb. cheese squares

Procedures: student must correctly weigh following amounts of cheese squares:

a. ½ lb.

b. 10 oz.

c. 2 lb.

d. 24 oz.

Scoring: 1 point each correct response

Task 4

Materials: oven with "knob" controls

Procedures: student must set oven to following temperatures:

a. 350°

b. 275°

c. 325°

d. 300°

Scoring: 1 point each correct response

Food Service - Exiting Skills Cont'd

Task 5

Materials: Cutting board, knife, 1 raw carrot
Procedures: student must cut carrot into 4 equal parts
Scoring: 1 point each equal part

Task 6

Materials: scoop, pint potato/macaroni salad, 4 small dishes
Procedures: student must place equal portions into each dish
Scoring: 1 pt: none same
2 pts: 2 equal
3 pts: 3 equal
4 pts: all equal

Task 7

Materials: paring knife/potato peeler, raw potato
Procedures: student must peel potato
Scoring: 1 pt: less than ½ peeled
2 pts: ½ peeled
3 pts: 3/4 peeled
4 pts: completely peeled

Task 8

Materials: knife, potato from Task 7
Procedures: student must correctly:
a. cut potato in half
b. cut one of the halves in thirds
c. cut one of the halves in quarters
Scoring: 1 point each correct response

Task 9

Materials: knife, pieces of potato from Task 8
Procedures: student must dice pieces of potato
Scoring: 1 pt. ¼ pieces are of uniform size
2 pts. ½ pieces are of uniform size
3 pts. 3/4 pieces are of uniform size
4 pts. all pieces are of uniform size

Food Service - Exiting Skills cont'd

Task 10

Materials: spatula, flat grill, 1 egg, 1 pancake, 1 hamburger, 1 grilled cheese sandwich

Procedures: student must flip each item to following criteria:

egg: Without breaking yolk

pancake: without breaking apart

hamburger: without breaking apart

grilled cheese: without separating

Scoring: 1 point each correct response

Task 11

Materials: blunt knife, can of icing, 1 uniced cake

Procedures: student must ice cake

Scoring: 1 pt. cake not completely covered

2 pts. cake covered but crumbs present

3 pts. cake covered but extra icing on plate

4 pts. cake covered, no crumbs or extra icing

Task 12

Materials: 1 rolling pin, 1 bowl dough, flour, 1 pastry board

Procedures: student must roll dough to ¼" thickness

Scoring: 1 pt. dough too thick

2 pts. dough too thin

3 pts. dough ¼" thick, with holes/tears

4 pts. dough ¼" thick, no holes/tears

Task 13

Materials: dough from Task 12, cookie cutters

Procedures: student must cut as many cookies as possible

Scoring: 1 pt. enough dough remains for 6 or more cookies

2 pts. enough dough remains for 5 or fewer cookies

3 pts. enough dough remains for 3 or fewer cookies

4 pts. no dough remains for any cookies

Task 14

Materials: 1 unsliced loaf bread, bread knife, cutting board
Procedures: student must slice 4 equal slices of bread
Scoring: 1 point each equal slice

Task 15

Materials: 1 unsliced loaf bread, 1 machine slicer
Procedures: student must use machine to slice bread
Scoring: task completed correctly - 2 pts.

Task 16

Materials: cookies from Task 13, baking sheet
Procedures: student must place as many cookies on baking sheet as possible
Scoring:
1 pt. room left for 6 or more cookies
2 pts. room left for 4 or 5 cookies
3 pts. room left for 3 or fewer cookies
4 pts. optimal use of space

Task 17

Materials: set of 6 color chips from lightest to darkest brown
Procedures: student must seriate color chips from lightest to darkest
Scoring:
1 pt. 2 chips in correct order
2 pts. all but 2 chips in correct order
3 pts. all but 3 chips in correct order
4 pts. all chips in correct order

Task 18

Materials: set of tubes of icings in primary colors and white, small bowl, spoon
Procedures: student must mix icings to form following colors:
green
purple
orange
pink
Scoring: 1 point each correct response

Task 19

Materials: can of peaches, bottle of salad dressing and box of crackers

Procedures: student reads information on containers and answers questions on following:

a. proper storage
b. amount/weight of contents
c. first three listed ingredients

Scoring: 1 point each correct response for each container, divide by 3, and round to nearest whole number

Task 20

Materials: Sample menu

Procedures: student must correctly answer following:

a. can a person come at noon and order breakfast? (no)
b. a mushroom omelet costs how much? ($2.45)
c. how much extra for any sandwich on a bagel? (.20)
d. how large are the hoagie rolls? (12")

Scoring: 1 point each correct response

Task 21

Materials: sample time card

Procedures: student must indicate correct space for entering the following information:

a. name
b. amount due
c. signature
d. night out

Scoring: 1 point each correct response

Task 22

Materials: sample tax table

Procedures: student must locate correct tax for following amounts:

a. $1.35 (.09)
b. $ .60 (.04)
c. $2.25 (.14)
d. $ .95 (.06)

Food Service - Exiting Skills cont'd.

Task 23

Materials: sample blank guest check, pencil

Procedures: student must write following order dictated by examiner:

hamburger with mustard, lettuce and tomato
coke;
french fries;
chocolate sundae

Scoring: 1 point for each item legibly written

Task 24

Materials: sample receipe

Procedures: student must correctly relate the order of the directions

Scoring: 1 point each correct response

Task 25

Materials: sample check with items and prices

Procedures: student must correctly total check

Scoring: 2 points for correct response ($3.66)

Task 26

Materials: Bills and change

Procedures: student must provide correct change for following:

	Bill	Given	Change
A.	$4.25	$5.00	$ .75
B.	$1.10	$5.10	$4.00
C.	$ .93	$1.00	$ .07
D.	$ .28	$ .53	$ .25

Scoring: 1 point each correct response

Task 27

Materials: 4 items, either portable equipment or large containers of food (over 20 lbs)

Procedures: student must individually lift and carry all 4 items to opposite side of room

Scoring: 1 point each successful item

Food Service - Exiting Skills cont'd.

Task 28

Materials: 4 tray set ups:

a. full water pitcher and empty glasses
b. filled water glasses
c. filled coffee cups
d. dishes for 3 placements

Procedures: student must carry tray across room without spilling or shifting of contents

Scoring: 1 point each successful item

APPENDIX F

"Hands-On" Instrument Project

Rational Paper

The porpose of this paper is to present a definitive rational for the design of a "hands-on" instrument by which the vocational classroom teacher can diagnose entry skills and measure exit skills of special education students. In order to meet this goal the following pages are arranged to:

Present the needs of the teachers as a result of mainstreaming the special education student.

Present types of instruments now available.

Propose a set of guidelines to be followed in order to construct the entry and exit skills measured.

In dealing with a classroom containing both regular and EMR students, the vocational teacher is faced with the task of dealing with a more heterogeneous group in terms of academic skills. For this reason the teacher needs to vary the curriculum presentation and his/her ability to do this depends on the availability of diagnostic information about the required prerequisite behaviors and how many of these behaviors a student exhibits.

Counselors and psychologists currently have a number of diagnostic instruments available to them which they use to place "special needs" students in situations in which they are most likely to succeed. Unfortunately these placements are often made according to what counselors feel are appropriate behaviors for the vocational classroom without having first interacted with vocational instructors. They, therefore, use the instruments as aptitude tests which Michael (1958) defines as devices which are used to measure a person's capacity, or hypothetical potential, for the acquisition of a certain more or less well-defined pattern of behaviors involved in the performance of a task with respect to which the individual has had little or no previous training.

The types of diagnostic instruments presently available are the pencil-paper and manipulative ones that are referenced in the Mental Measurements Yearbooks (Buros) and the work sample tests which have recently grown in popularity.

The history of the aptitude tests both specific tests, and multiple batteries, dates back to the early twentieth century and the work of Spearman (Thorndike, 1971). More work in this area increased during World War II when a large number of tests of different abilities were required for the selection and classification of personnel with respect to many technical assignments. The measuring process was further refined during the 40's and 50's with the work of such well known psychometricians as Thurstone, Guilford and Bennett.

A brief review of the tests listed in the Mental Measurements Yearbook will attest to the fact of the popularity of aptitude tests. Tests related to skills in manual dexterity, mechanical comprehension, clerical aptitude as well as multiple aptitude batteries will be presented in this paper.

The Seventh Mental Measurement Yearbook (Buros, 1972) offers information concerning five different tests of manual dexterity. Two of the most popular of these are:

1. Crissey Dexterity Test - This test consists of a rectangular with 128 wells and 64 cylindrical pegs. Instructions are given to move pegs from the wells at one end of the board to the 64 wells at the other end while turning the pegs over. The test is designed to measure the ability to work with the hands in a coordinated manner. It is recommended as a pre-employment screening test for assembly, packing, simple machine operation, and other jobs which require

extensive use of the hands. The test requires a five-minute administration time.

2. Minnesota Rate of Manipulation Test - The test contains two rectangular boards each with 60 wells and also 60 cylindrical blocks. The test offers 5 subcores; placing, turning, displacing, one hand turning and placing, and two hands turning and placing. The test can be administered in 50 minutes. It is used for selecting applicants for jobs arm-hand manipulatory movements.

Buros also presents summary information and some technical reviews on ten different mechanical ability tests. Two of the more widely used tests in this group are:

1. Bennett Mechanical Comprehension Test - This pencil-paper test purports to measure the ability to understand mechanical relationships and physical laws in practical situations. Test items are drawings with simple-phrased questions about them. The manual also states that the test is useful in selecting personnel for mechanical work, apprentices and students for technical and engineering training. Administration time is 30-35 minutes.
2. Revised Minnesota Paper Form Board Test - According to the test manual this is a 20-minute speeded test consisting of 64 two-dimensional diagrams cut into separate parts. For each diagram there are five figures with lines indicating the different shapes out of which they are made. The examinee is to choose the one figure which is composed of the exact parts that are shown in the original diagram. The test is used for prediction in those fields with a mechanical orientation.

Twenty-four different clerical tests are listed in the latest yearbook. One instrument which is excluded from this list, yet has been quite popular, is the Minnesota Clerical Test. This test which can be administered in 15 minutes is comprised of two parts, Number Checking and Name Checking. Each part contains a column of parts of numbers or names and the person is to check if the two members of each pair are the same or different. The scores are given as measures of speed and accuracy.

The popularity of multi-aptitude test batteries arose from two basic problems in dealing with the use of a number of specific tests. These problems as presented by Thorndike and Hagen (1965) were: first, it was difficult to assemble a well-rounded set of tests to cover the range of abilities significant for a program of guidance or personnel classification; and second, the norms for different tests were not based on the same sorts of groups, so it was not possible to treat norms from the different tests as equivalent.

Buros' current publication lists 10 different multi-aptitude batteries. Two of the most widely used of these are:

1. Differential Aptitude Tests - This comprehensive battery offers nine separate scores; verbal reasoning, numerical ability, total, abstract reasoning, space relations, mechanical reasoning, clerical speed and accuracy, spelling and grammar. The battery which is contained in two booklets is usually administered in at least two sittings and requires between 3 and 4 hours of testing time. Verification of the popularity of this instrument can be judged by the 268 different research references cited in the Mental Measurements Yearbooks.

2. General Aptitude Test Battery - This is also a widely researched instrument in that 402 separate articles are referenced in the Mental Measurements Yearbooks. Nine scores are also elicited from this battery. They are: intelligence, verbal, numerical, spatial, form perception, clerical perception, motor coordination, finger dexterity and manual dexterity. The entire battery can be administered in about 2½ hours.

The second type test which has been the most common but probably the least standardized is the work sample. For many years employers have asked prospective employers to perform job relevant tasks which were then evaluated and used in hiring procedures. Recently in conjunction with the popularity of this format in rehabilitation counseling, more systematic work sample systems have been available commercially. These systems are expensive; however, a recent study suggests that it would cost at least twice as much to develop your own system (Dunn, 1973).

The Manpower Research Panel (January, 1973) has proposed that the work sample approach is superior to traditional assessment methods with certain populations for at least two major reasons:

1. Clients with limited reading skills cannot perform adequately on paper-pencil tests. Work sample techniques utilize actual job tasks or task components, and involve verbal skills only to the extent that such skills are inherent to task performance.
2. Work sample tasks do not generate as much test anxiety in disadvantaged persons who may mistrust or fear standardized tests. Rather, they induce greater motivation to perform by providing a type of actual work experience to persons whose previous contact with the world of work may have been slight. The obvious relevance of the work sample to real job

tasks also may help to overcome the reluctance of clients to perform on tests that they do not see as pertinent to the job. Four of the most popular commercial systems are described on the following pages.

1. JEVS

The JEVS Work Sample Battery consists of 28 actual work activities performed in a simulated work setting. The samples which represent ten Worker Traits Group Arrangements of occupational categories from the DOT are administered in a hierarchy of complexity. Tests administration is completed when the client has performed all 28 of the tasks, or is no longer able to perform satisfactorily. Clients are not pressured to work on samples which they do not want to attempt. A well-trained evaluator can prepare a report on examinee's skill levels, work habits, personal appearance and interpersonal facility in work situations. The evaluation process requires approximately two weeks to complete. The samples include:

1. Nut, Bolt and Washer Assembly
2. Rubber Stamp
3. Washer Threading
4. Budgette Assembly
5. Sign Making
6. Tile Sorting
8. Collating Leather Samples
9. Grommet Assembly
10. Union Assembly
11. Belt Assembly
12. Ladder Assembly
13. Metal Square Fabrication
14. Hardware Assembly
15. Lock Assembly
16. Filing by Numbers
17. Proof Reading
18. Filing by Three Letters
19. Nail and Screw Sort
20. Adding Machine
21. Payroll Computation
22. Computing Postage
23. Resistor Reading
24. Pipe Assembly
25. Blouse Making
26. Vest Making
27. Condensing Principles

3. Singer System

The Singer System presently is comprised of 20 work samples stations representing a variety of occupational clusters. Each station is fully equipped with representative tools from each occupational area, a study-mate sound/filmstrip projector, earphones and a remote control switch which allows the students to start and stop the presentation and thus set their own work pace. The work samples are independent and can be administered according to the student's preferences. Actual work time is usually one to three hours per station, however, some such as Sheet Metal may require more time. The system relies on the evaluator's objective use of criteria offered in the test manual to obtain both aptitude and interest measures for the student on each attempted sample. The work station areas represented in this system are:

1. Sample Making
2. Bench Assembly
3. Drafting
4. Electrical Wiring
5. Carpentry
6. Refrigeration, Heating and Air Conditioning
7. Solder-Weld
8. Sheet Metal
9. Office-Sales
10. Needle Trade
11. Masonary
12. Cook-Baker
13. Medical Service
14. Engine Service
15. Plumbing-Pipefitting
16. Cosmetology
17. Data Calculation and Recording

4. COATS (COMPREHENSIVE OCCUPATIONAL ASSESSMENT AND TRAINING SYSTEM)

The system is much broader than the other three in that it contains a Work Sample component as well as three others. The other components are Job Matching, Employability Attitudes and Living Skills. The COAT's work sample system is similar to the Singer in that it uses an audio visual, individualized, self-paced format. All 10 samples are portable and can easily be installed in a single common station. This system has been constructed by selecting specific job families from USOE Career clusters.

The following work samples are presently available with this system:

1. Drafting
2. Clerical/Office
3. Metal Construction
4. Sales
5. Wood Construction
6. Food Preparation
7. Medical Services
8. Traveling Services
9. Cosmotology/Barbering
10. Small Engines

These same instruments which are useful to counselors in placement situations can also be helpful to vocational instructors in a different manner. Michael (1958) has stated that the manner in which a test is employed determines what type of test it is. His definition of an aptitude test has already been given. The instruments as employed in a systematic manner by vocational instrutors would be classified as employed in a systematic manner by vocational instructors would be classified as ability tests. He defines an ability test as a device used to measure current performance of an individual on a task near his maximum level of motivation. The task is assumed to be one in which the student has a limited amount of more or less loosely structured experience.

A need for "hands-on" entry and exit skills instrument to be used by vocational teachers with special education students exists because:

1. Legislation mandates the vocational training of special needs students.
2. Mainstreaming offers an efficient and productive manner in which to offer this training to special needs students.
3. Teachers are required to deal with much more heterogenous groups in terms of academic preparations.
4. Teachers must work as diagnosticians in planning a training program which allows each student to work to his fullest potential.

Given these four points, it has been noted that certain aptitude measures are available which can be used in a different manner in order to allow the vocational instructor to deal with the weaknesses of the students.

It is the goal of this project to use these tests and other measurement methods to construct instruments which can be used to supplement an individualized curriculum package but not, however, to prescribe placement within the package. The entry level test will be constructed with the intent of identifying sequence. Likewise, the exit skills test will be constructed to measure proficiency required to enter the labor force. A unique aspect of this endeavor is to construct a concise yet comprehensive diagnostic tool which can be used independently by the vocational instructor.

The process to be followed is a combination of procedures offered by Flanigan (1951), and Super et al. (1962) and Borgen and David (1974). The Flanigan approach to constructing a test rationale is based on a three-step process of 1) description of behavior, 2) analysis of behavior and 3) item-specifications. The Super et al. plan calls for

Job analysis, selection of traits to test, selection of criteria of success; item construction, standardization, validation, and cross-validation. Borgen and David (1974) present a procedure for evaluating students through an organized method for identifying competencies and writing performance objectives.

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